

# The braid is being woven: IoP, confidential agents, and immortality

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## Abstract

In the eye-blink that has elapsed since the turn of the millennium, the Web utterly transformed the lives of those of us who work with information. But the strong emphasis on social networks indicates that time might be mature for a paradigm-shift on the way we aggregate and process information, where the focus is shift from documents to humans. The Internet of People (IoP) protocols might host a truly different way of processing confidential information by exploiting the impressive growth on conversational agents (CAs), whose “ambition” is to exhibit human-like knowledge representation and learning skills. What about the virtual life of CAs of deceased people? IoP, with the collection of our own lifebits, and CAs seem to be strands of a growing braid to hang on to aspire to immortality.

## The Web and the land of Serendip

According to Wikipedia, “The Three Princes of Serendip” is the English version of the “*Peregrinaggio di tre giovani figliuoli del re di Serendippo*”, published by Michele Tramezzino in Venice in 1557. The story, which has become mostly known because of the word serendipity, has a curious and controversial origin, yet it clearly conveys the moral that by “accidents and sagacity” you may discover something, which is well beyond your expectation. This might have happened to the Web, where Tim Berners-Lee’s clever intuition on how to spread a web of documents has revealed a viral contamination that he himself couldn’t have fully figured out. Interestingly, this form of serendipity seems to be rooted in the science of networks. The choice of allowing one-way hyperlinks has increased the average number of the Web vertex degree with respect to the case of bidirectional links, that was a sort of tacit assumption for hypertexts at that time. It has been shown that the probability distribution of inbound and outbound links follows a power law with exponent empirically determined as 2.1 and 2.7, respectively [1]. In a Web of bidirectional links, the attachment process would have been remarkably weaker, with correspondent larger exponents in the power law probability distribution. Amazingly, the studies on the breakdown of networks by Sholomo Havlin et al [2] indicate that, while there is a critical threshold under which the vertex removal leads to break of the network into pieces, this critical threshold disappears whenever the degree exponent is smaller or equal to three. What could have been the value of those exponents for a web of bidirectional links? If it had been greater than three, search engines could have had harder time in crawling a fragmented web with a huge number of separated clusters, and the fantastic searching mechanisms that we experiment nowadays would have been likely a dream. In the eye-blink that has elapsed since the turn of the millennium, the Web utterly transformed the lives of those of us who work with information. Sir Tim Berners-Lee, knighted in 2004 by Queen Elizabeth for his service to the global development of the Internet, created a “land of Serendip,” where accidents and sagacity have been offering scientific and economic challenges that go well beyond the initial expectations.

## Shifting the focus to humans: life book and the IoP

While the dawn of the Web was primarily dominated by the vision of a huge treasure of information and of impressive sources of knowledge, the explosion of social mechanisms have been opening new fantastic challenges, that are far away from being fully framed and understood. The focus has been quickly shifting on the natural human need to show up in any social context. Social networks allow us to upload pictures, video, and post messages. You neither need to be a Hollywood star, nor a rich businessman, nor a scientist to live in

this dimension. Amazingly, these life bits<sup>1</sup> and tons of others personal digital collections only keep a partial trace of individual digital resources, since many of them populate the Web. Unlike social networks, the outcome of the queries to search engines has typically a truly informative nature, and there is no focus on people as a whole, since in this case their life bits are spread in the Web. This reminds us of abandoned old dusty books in libraries<sup>2</sup>; search engines bring them to life, but we are still missing the major goal of collecting them all in a unified framework to compose the life book. *History has always had the focus on man more than on information, and this is what we are primarily missing with the current technology.* Perhaps, the time has come to shift the focus on people as a whole, thus prospecting a new viewpoint, which goes well beyond social networks. Regardless of whether life bits are photo, video, personally uploaded posts, blogs, newspaper clippings, video lectures, or song performance uploaded by someone else, we can think of human-centered aggregation mechanisms. In so doing, all the life bits of a person fall in the same “folder”, regardless of whether they are formal documents or pictures of birthday parties, with the ultimate goal of composing a unified “digital picture” of each individual, who is willing to be part of this challenge.

### *Reconciling history with the digital era*

In the Microsoft Mylifebits project [4], tons of life bits have been accumulated in lab environment by different sensors, and have been stored in a personal digital archive that is both searchable and secure. The Google’s fiction-like virtual reality glasses and other commercial cameras, that can easily be “dressed”, could serve a similar task of accumulating life bits for common people. How long will we wait until those life bits be integrated with human Web traces and social networks? Has the time come of *life books*? Several concurrent factors indicate that, sooner or later, a human-centered view of information is doomed to emerge, and we might focus on people, on their social mechanisms, as well as on their traces on the Web. We could start thinking of a digital “*alter ego*” (Latin for “the other I”) who provides us with instant access to our life experiences. For example, we remember we had been in Weingarten (Germany), at the Autumn School on Hybrid Systems about 20 years ago! This “life bit” might stimulate the curiosity of marking on a map all German cities we have visited as a tourist and/or as a scientist. It was on September – perhaps five years ago - we gave a talk at the CSAIL - MIT; are there any video or pictures, including dinner with colleagues? Are there any related post on facebook / G+? Our traces, some of which we might be unaware of, are fragmented in the digital space in places where they are not always safe, with no juridical framework that allows the respect of any rights. Our digital heritage is of great values for families and friends and, therefore, its organic and homogeneous presentation is definitely likely to be a great target for the years to come. The systematic organization of the “book of life” is a truly new scientific and economic challenge to match the persistent human dream of living forever, at least in the form of your alter-ego. It is a way of matching the need to remember a loved one who passed away, it is an answer to the frivolous desire of appearing anywhere. Interestingly, there might be something more than offering an organized book of your life, a room for conveying your emotions. From the dawn of the Web, while the opportunity of using a huge wall on which to freely express thoughts has been clearly recognized as a great vehicle of democracy, there has been a growing feeling of suspiciousness on the way this progressive accumulation of information might affect the way in which history and politics will be accessible. Viewed as an archive, the Web embodies deep contradictions. No one controls its content, but the easy way we can publish does not necessarily imply access: in order to find things we must consult the gatekeepers. As pointed out in [5], search engines are the *de facto* arbiters of the online memory. Since they are private organizations without any public accountability, the risk of control is even higher than for state-controlled archives, which are monitored by historians and civil organizations. Interestingly, the birth of a life book might regenerate the original spirit of the Web, which could be kept alive by this new gathering mechanism. If we think of people who contribute to shape the history, by adopting this human-centered view of information, we would restore the traditional context in which specific “archives” could be monitored by historians and civil organizations. The life book seems to be a way to address the dichotomy between the Web as a repository and the Web as a retrieval system, which arises naturally from Derrida’s viewpoint expressed by “No archive without outside” [6]. The exterior is needed to make it meaningful to talk about the interior. While the centralized ranking mechanisms makes the historical and political documents in the Web under the centralized control of search engines, a human-centered view removes the fragmentation of life bits and restore traditional reconstruction mechanisms under a distributed

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<sup>1</sup> The idea of life bits was evoked by Vannevar Bush (1945) in Memex and, more recently, it was brought to the attention of the scientific community by Microsoft in the Mylifebits project [3].

<sup>2</sup> “Indeed the book is by no means an object; neither is it an act, nor even a thought. Written by a dead man about dead things, it no longer has any place on this earth; it speaks of nothing which interests us directly. Left to itself, it falls back and collapses; there remain only ink spots on musty paper”- Jean-Paul Sartre [4].

control, thus reconciling history with the digital era.

### *Technological challenge and privacy issues*

The shift of focus from informational resources to humans requires a new identification mechanism, namely a Personal Identifier (PI), which reminds us of the Uniform Resource Identifier (URI). Regardless of the way the life bits come from we need to attach them their PI. While in many cases people themselves can attach their identifiers, in other cases the automatic attachment of the personal identifier is an open scientific challenge. This holds for any type of resource, but especially for multimedia information.

The problem of retrieving life bits requires the construction of indexing mechanisms to handle visual and vocal information. We are in front of problems that resemble related challenges in research centers and companies like Microsoft and Google. The targeted breakthrough is to overcome the shortcomings that are inherently associated with current machine learning mechanisms, which simply lack the flexibility to undergo the significant structural changes required to interact in realistic open-ended environments. We are currently lacking computational frameworks in which agents are expected to live and interact in their own environment supported by mechanisms that allow massive restructuring.

There is another crucial problem, which calls for clever technologic solutions: How can the systematic construction of a life book be compatible with the labyrinth of privacy requirements? How can we keep some of our private life bits secret? Can we take the opportunity of the life book to easily ask for the removal of something we publish? If you were thinking that the birth of the Web and of the social networks have already exhausted the main research directions and have already shaped the future of technology for the years to come, you might be disappointed and surprised: Don't overlook the need for a truly human-centered vision of the Web, the need to integrate public and personal life bits in a unique life book. Playing with Sartre's metaphor of books that come back to life [4], the fragmented life bits on the Web and tons of other personal life bits are just waiting to lend their body to the dead in order that they may come back to life. And from another point of view they are waiting for a contact with the beyond. They speak of nothing which interests us directly. Left to themselves, without a life book, they fall back and collapse; there remain only ink spots on musty paper.

### *Internet of people as the natural environment for the life book*

While at the turn of this millennium, the notion of "internet of things" had already began to contaminate the scientific community, we had to wait nearly fifteen years for scientists to become aware of the different viewpoint that is behind the Internet of people. Amongst others, the human-centered point of view was addressed by Argentine entrepreneur Luis Fernando Molina, who founded the Fermat project in 2014 <http://www.fermat.org/>. IoP is a decentralized network of nodes, where a peer-to-peer protocol enables a direct communication. A main purpose of the project is that of offering people the freedom of administering their life bits. The IoP is also supposed to offer also an infrastructure for business without intermediaries, thus lowering the barriers of entry <https://iop.global/>. The IoP infrastructure seems to be very well-posed to host life books of people and, later on, smart confidential agents.

## **"Alter ego" and confidential agents**

What if our relation with the inseparable smartphone would be strengthened so as to regard it a sort of "alter ego", which is acquiring and mirroring all our life bits? The search for a second self has been an intriguing issue since Cicero coined the term by referring to a second self, a trusted friend. In his letters to Atticus he writes "I am reproaching myself far more than you, and if I do reproach you it as *my alter ego*; also I am looking for someone to share the blame" [7]. While the smartphone couldn't match the need to host our life book, one could easily think of its extension on a personal server under our full control. The alter ego would take the form of a "confidential agent" (CA) which carries out conversations on our daily experiences. It is not supposed to be yet another conversational agent, since it is expected to be mostly involved in information on our own life. Because of the focus on people, the CA nicely meets the IoP concept. While CAs are mostly expected to reflect our own experience, thus mirroring our thoughts, they are also expected to communicate with other people, as well as with their CAs.

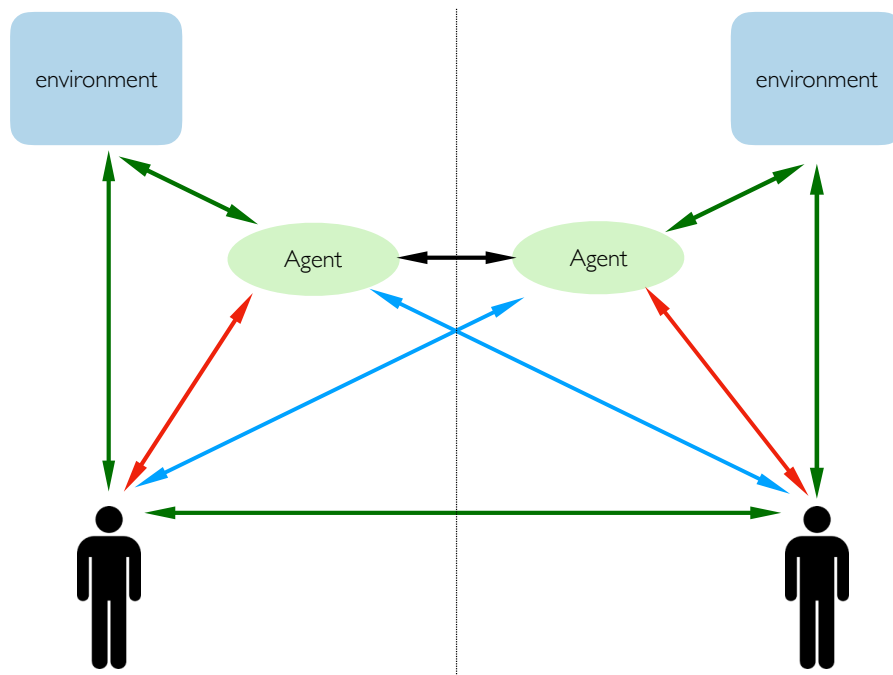


Fig. 1 - Human to human ordinary communication (green) is enriched by Confidential Agents (CAs) which sustain confidential conversations with their own agent (red). CAs also sustain conversations with other people (blue) and their own agents (black).

The overall communication scheme is sketched in Fig. 1, where we can see that CAs sustain confidential conversations with their own agent, with other people, and with their own CA. What immediately jumps to the eyes from this communication scheme is the different life book of the agents that can be accessed only by ordinary human communication or by talking with CAs. This immediately raised security issues on the exposition of the book, on which one must carefully define what portion (to whom) is supposed to be shared.

## Steps towards immortality

Life books and CAs can live forever. As a person passes away, his CA can still be available in the IoP environment. It can also continue to learn and interact with humans and CAs, thus prospecting a truly virtual life. This artificial life can reflect all the life experiences and can be enriched with post-mortem virtual communication. It can be expressed by astonishing linguistic remarks, as well as by emotions supported voice and facial expressions. A countless number of social and ethical implications naturally arise that were never considered in the “brief human history of humankind.” As pointed out ([8]), in this brief history, the most distinctive feature of homo sapiens is not intelligence, but the ability of telling stories. “We believe in gods, nations, money and human rights ... only Sapiens can believe such stories. This is why we rule the world, and the chimpanzees are locked up in zoos and research laboratories.” We rely on imagination: the IoP and CAs seem to be strands of a growing braid to hang on to aspire to immortality. This cannot be ignored. However, it is hard to prospect the concrete evolution of this story and, especially, the extent to which confidential agents will act as our alter ego. When playing with nowadays conversational agent, one soon develops the suspicion that we are in front of agents which can deal pretty well with specific tasks, but with very limited capabilities of understanding unrestricted linguistic environments. While the evolution of machine learning opens the doors to new agents living in their own learning environments ([9], Ch. 6), it is really hard to predict whether these computational models will be the basis for a remarkable transition in the understanding process. The braid to hang on to aspire to immortality might be longer than one would expect. When Ray Kurzweil published “The Singularity is Near” [10], one might have predicted a shorter braid to hang on to aspire to immortality.

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